

CLAIMS

1. A bistable nematic liquid crystal device comprising
- 5 two cell walls enclosing a layer of liquid crystal material;
- electrode structures on both walls;
- 10 a surface alignment on the facing surfaces of both cell walls providing alignment to liquid crystal molecules;
- means for distinguishing between switched states of the liquid crystal material;
- 15 CHARACTERISED BY
- a surface alignment grating on at least one cell wall that permits the liquid crystal molecules to adopt two different pretilt angles in the same azimuthal plane.;
- 20 the arrangement being such that two stable liquid crystal molecular configuration can exist after suitable electrical signals have been applied to the electrodes.
2. The device of claim 1 wherein the grating comprises a single asymmetric
- 25 modulation whose groove depth and pitch ratio provides bistable alignment.
3. The device of claim 1 wherein the grating comprises a single symmetric modulation whose groove depth and pitch ratio provides bistable alignment.

4. The device of claim 1 wherein the grating material induces a homeotropic orientation of the liquid crystal director with respect to the local surface direction.
- 5 5. The device of claim 1 wherein the grating surface is treated with a surfactant in order to induce a homeotropic orientation of the liquid crystal director with respect to the local surface direction.
6. The device of claim 1 wherein one cell wall has a bistable grating surface and the
10 other cell wall has a flat surface which induces a homeotropic alignment.
7. The device of claim 1 wherein one cell wall has a bistable grating surface and the other cell wall has a flat surface which induces a planar alignment with or without a preferred alignment direction
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8. The device of claim 7 wherein the planar alignment provides a surface pretilt between 0° and 60° .
9. The device of claim 1 wherein both cell walls are bistable grating surfaces.
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10. The device of claim 1 wherein the liquid crystal material has a positive dielectric anisotropy.
11. The device of claim 1 and further including means for applying unidirectional
25 voltage pulses whereby the bistable state is selected by a coupling between the applied field and the flexoelectric polarisation present in a bent or splayed liquid crystal material.

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12. The device of claim 1 and further including means for applying unidirectional signals at two different frequencies and wherein the nematic material is two-frequency addressable liquid crystal material..

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13. The device of claim 1 wherein the grating groove profile varies within each pixel area and or between adjacent pixels.

14. The device of claim 1 wherein the electrodes are formed as a series of row and column electrodes arranged in an x, y matrix of addressable elements or display pixels.

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15. The device of claim 1 wherein the means for distinguishing between switched states includes a dichroic dye in the liquid crystal material.

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16. The device of claim 1 wherein the means for distinguishing between switched states includes at least one polariser.